

WHAT IS CLAIMED IS:

1. A road monitoring method for a vehicle using a camera,
comprising:

receiving a picture signal from said camera;

detecting a target from said picture signal;

calculating a horizontally estimated distance from said vehicle to said
target;

calculating variables including a vertical angle of said target on a
circumference and a curvature radius of said circumference; and

calculating an actual distance from said vehicle to said target based on
said vertical angle and said curvature radius.

2. The road monitoring method of claim 1, wherein said calculating a
horizontally estimated distance calculates said horizontally estimated distance
as a value of L satisfying an equation $L = \alpha \cdot h \cdot \frac{f^2 + y \cdot c}{f \cdot (y - c)}$, where α , f , h ,

c , and y respectively denote a proportional coefficient, a focal distance of
said camera, a height of a center of said camera from a road surface, a vertical
picture-coordinate of a horizon of a flat road, and a vertical picture coordinate of
said target.

3. The road monitoring method of claim 1, wherein said calculating
variables comprises:

determining whether a road is curved upward or downward;

calculating said vertical angle of said target on said circumference; and

calculating a corresponding curvature radius among an upward

curvature radius and a downward curvature radius according to a determination of said determining whether said road is curved upward or downward.

4. The road monitoring method of claim 3, wherein, in said determining whether a road is curved upward or downward, a plurality of lane markers is detected from said picture signal and whether said road is curved upward or downward is determined based on a shape of said plurality of lane markers.

5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995

5. The road monitoring method of claim 3, wherein, in said determining whether a road is curved upward or downward, it is determined that said road is curved upward if a vertical picture-coordinate of a horizon in said picture signal is higher than a predetermined vertical picture-coordinate, and it is determined that said road is curved downward if a vertical picture-coordinate of a horizon in said picture signal is lower than said predetermined vertical picture-coordinate.

6. The road monitoring method of claim 3, wherein, in said calculating said vertical angle of said target, said vertical angle of said target is calculated as a value of ϕ satisfying an equation $c' = f \times \tan(\phi + \theta)$, where c' , f , and θ respectively denote a vertical picture-coordinate of a horizon in said picture signal, a focal distance of said camera, a value satisfying an equation $c = f \times \tan(\theta)$ where c is a vertical picture-coordinate of a horizon of a flat road.

7. The road monitoring method of claim 3, wherein, in said calculating a corresponding curvature radius, said upward curvature radius is calculated as

a value of R satisfying an equation $L = \frac{h \cdot R \cdot \sin \phi}{h - R \cdot (1 - \cos \phi)}$, where L , h , and ϕ respectively denote said horizontally estimated distance, a height of a center of said camera from a road surface, and said vertical angle of said target.

8. The road monitoring method of claim 7, wherein said value of R satisfying an equation $L = \frac{h \cdot R \cdot \sin \phi}{h - R \cdot (1 - \cos \phi)}$ is calculated based on a predetermined map having variables of said L and said ϕ .

9. The road monitoring method of claim 3, wherein, in said calculating a corresponding curvature radius, said downward curvature radius is calculated as a value of R satisfying an equation $L = \frac{h \cdot R \cdot \sin \phi}{h + R \cdot (1 - \cos \phi)}$, where L , h , and ϕ respectively denote said horizontally estimated distance, a height of a center of said camera from a road surface, and said vertical angle of said target.

10. The road monitoring method of claim 9, wherein said value of R satisfying an equation $L = \frac{h \cdot R \cdot \sin \phi}{h + R \cdot (1 - \cos \phi)}$ is calculated based on a predetermined map having variables of said L and said ϕ .

11. The road monitoring method of claim 1, wherein, in said calculating an actual distance, said actual distance is calculated as an absolute value of l , said l satisfying an equation $l = R\phi$, where R and ϕ respectively denote a curvature radius of said circumference.

12. A road monitoring system for a vehicle comprising a camera for generating a picture signal and an electronic control unit for receiving said picture signal and monitoring a road based on said received picture signal,

wherein said electronic control unit performs:

detecting a target from said picture signal;

calculating a horizontally estimated distance from said vehicle to said target;

calculating variables including a vertical angle of said target on a circumference and a curvature radius of said circumference; and

calculating an actual distance from said vehicle to said target based on said vertical angle and said curvature radius.

13. The road monitoring system of claim 12, wherein said calculating a horizontally estimated distance calculates said horizontally estimated distance as a value of L satisfying an equation $L = \alpha \cdot h \cdot \frac{f^2 + y \cdot c}{f \cdot (y - c)}$, where α , f , h , c , and y respectively denote a proportional coefficient, a focal distance of said camera, a height of a center of said camera from a road surface, a vertical picture-coordinate of a horizon of a flat road, and a vertical picture coordinate of said target.

14. The road monitoring system of claim 12, wherein said calculating variables comprises:

determining whether a road is curved upward or downward;

calculating said vertical angle of said target on said circumference; and

calculating a corresponding curvature radius among an upward curvature radius and a downward curvature radius according to a determination of said determining whether said road is curved upward or downward.

15. The road monitoring system of claim 12, wherein, in said

calculating an actual distance, said actual distance is calculated as an absolute value of l , said l satisfying an equation $l = R\phi$, where R and ϕ respectively denote a curvature radius of said circumference.